

# The Scientific Method and the Metric System

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The scientific method is a natural extension of human curiosity, based on logic and objectivity. Observations lead to questions. Questions lead to hypotheses, which are declarative explanations of the observations. These hypotheses logically imply predictions that would come true if the corresponding hypotheses were true. A scientific experiment is a way to test the validity of a hypothesis. The outcome of an experiment can either bolster or disconfirm the hypothesis.

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The scientific method is a way to test explanations about the universe, so that we can objectively determine what is true about our surroundings. Humans observe various things about their surroundings and question why things are that way. A scientist comes up with a hypothesis, which is an explanation for the observation. A hypothesis might be a completely incorrect explanation, so a scientific hypothesis must be tested by experimentation. Each hypothesis implies a specific prediction that would come true if the hypothesis were correct. Therefore, a scientific experiment is a way to see whether a hypothesis' prediction comes true. If a prediction does not come true, that is an indication that the corresponding hypothesis is not correct, and an alternative hypothesis must be made. If a prediction comes true, that is an indication that the corresponding hypothesis might be true, but it does not prove that it is true. Science can never prove things to be true. However, things that we call facts (like gravity or evolution) are things that never fail in repeated experimentation. Sometimes, what we had been calling a fact is found to fail experimentation, and scientists are forced to revise the set of facts. This would happen for gravity, for instance, if suddenly someone were to obtain the experimental result that a dropped object rises instead of falls.

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A quantity is something that can be measured, whereas the standard amounts in which quantities are measured are called units. Each quantity can be measured in different units, depending on the system of measurement. Most countries and all scientists use the metric system of units. Unfortunately, the United States continues to use the English system of measurement, which is much more difficult to learn, remember, and use than the metric system.

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The reason the metric system is so easy to learn and remember is that it is a decimal system, which means that it is based on powers of ten. Each quantity has a base unit. For example, the mass quantity has the base unit, gram. Larger and smaller units are denoted by affixing a prefix to the name of the base unit. For example, one kilogram is the same as one thousand grams, and one centigram is the same as one one-hundredth of a gram.

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Dimensional analysis is a way to convert from one measurement to another by multiplying together conversion factors. In dimensional analysis, units are always written along with magnitudes (numerical values). By setting up a dimensional analysis problem correctly, multiplication of the factors will cause all units to cancel except the units that should be in the answer.

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The only three countries that have not officially adopted the metric system are the United States, Liberia, and Myanmar.